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ABSTRACT

A self-report instrument (questionnaire/reaction scale) was developed and administered to students in grades 9-12 to: (1) determine the number of science courses taken by each grade level; (2) estimate the number of science courses requested for future years and indicate where recruitment efforts would be needed; (3) examine other-directed reasons for taking science (external locus of control), student understanding of the role of science education, student career aspirations, effects of science classroom atmosphere, and science/non-science teachers' classroom methodology; and (4) provide students with opportunity to express their views about science classes. Data are presented by sex (N=790: 406 males and 384 females) and grade level as percentages of responses to individual items and discussed by such categories as other-directed reasons for taking science and student career aspirations. Data suggest students take science because of, among others, their like of science and hands-on activities, parental influence, the fact that both sexes were encouraged by science teachers, understanding the role of science in total education, and their positive views of science teachers. Students did not appear to take science because of such other-directed reasons as counselor influence, effect of science on society, a desire to become scientists, or comparing science teachers to other teachers or courses. (Author/JN)

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A Composite Self-Report:

Reasons for Taking Science Courses

as given by

Cocoa High School Science Students

Cocoa, Florida

Frances H. Louwerse, Chairman
Science Department
Cocoa High School

June 17, 1981

U.S. DEPARTMENT OF EDUCATION
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INTRODUCTION

The reason for devising and administering this instrument was to determine, if possible, Cocoa High School (CHS) students' reasons for taking science. The impetus for this task was an outgrowth ot the CHS science department's Self-Study for the Southern Association of Secondary Schools and Colleges' Ten Year Evaluation of CHS. We were not able to give quantitative reasons for our students' taking science beyond the one course requirement for graduation, grades ten through twelve.

I constructed the combination self-report reaction-questionnaire for the students' responses. Three others were asked to read the items and offer suggestions, some of which I accepted. Those which I accepted are in the section which deals with comparisons of science teachers' methods and those of other CHS teachers. I accept full responsibility for the faults which may be apparent in the total.

The Instrument

The self-report is in reality a combination questionnaire and reaction scale. Each report may be designated by grade level and sex of the respondent.

The first two questions are straightforward. In the first, we can determine the number of science courses taken by each group. The second question allows for an estimate of the number of courses which may be asked for in the future, at least by those presently taking science. Furthermore, the answers to this question will show where recruitment efforts need to be placed.

In part three, there are 21 statements with a reaction continuum

of Strongly Agree through Strongly Disagree. These 21 items may be categorized in the following ways: Other-Directed Reasons for Taking Science (External Locus of Control); Student Understanding of the Role of Science Education; Student Career Aspirations; Effects of Science Classroom Atmosphere; and Comparison of Science Teachers' Methods with those of other Teachers'.

The last four items are open-ended questions.

To insure that all students would receive the same instructions, I gave a copy of these to all of the science teachers. This instrument was administered to all of the students who were present in their science classrooms on May 12, 1981.

A copy of the instrument and the directions are on the following pages.

Please read the following to the students after they have been given the self-report.

To the Students:

"We believe that you can supply information which will help us to improve the science classes at Cocoa High School.

Directions: Circle female or male and the grade you are now in.

Answer questions 1 and 2 by circling the number, or if other, then write the correct number in the blank.

(Wait.)

For question 3, please read each statement carefully, then select one of the five choices- Strongly Agree (SA); Agree(A); Undecided (U); Disagree (D); or Strongly Disagree (SD).

When you have finished, please answer questions 4, 5, 6, and 7 on the back of the paper in your own words.

When you have completed this paper, quietly take it to the table where I have placed the folder and place it face down.

NO NAMES, PLEASE."

FEMALE MALE (CIRCLE)

GRADE 9 10 11 12 (CIRCLE)

1. How many Cocoa High School science courses have taken ? (Include this year in your count.) 1 2 3 4 _____ other

2. While you are a student in cocoa High School, how many science classes do you plan to take? 1 2 3 4 _____ other

3. Rate the following statements as they apply to you. circle your choice.

SA = Strongly Agree A = Agree U = Undecided D = Disagree

SD = Strongly Disagree

I need to know about the things I can learn in science classes.	SA	A	U	D	SD
I want to go to college and I believe that science courses will help me to be prepared.	SA	A	U	D	SD
I take science because there is nothing else to take as an elective.	SA	A	U	D	SD
I want to be a scientist.	SA	A	U	D	SD
My parents want me to take science.	SA	A	U	D	SD
I needed to fill my schedule and my counselor suggested a science course.	SA	A	U	D	SD
I have a feeling of success in my science class.	SA	A	U	D	SD
My future career requires a science background.	SA	A	U	D	SD
Science teachers allow more reasonable freedom than other teachers.	SA	A	U	D	SD
Science teachers expect me to work too hard.	SA	A	U	D	SD
I like to work with my hands and move around during class.	SA	A	U	D	SD

I like the teacher in the science class.	SA	A	U	D	SD
I am living in a time when scientific research has reached into most of life's activities. For this reason, I want to take as much science as I can.	SA	A	U	D	SD
I want a well-rounded education, this includes science.	SA	A	U	D	SD
Science teachers seem to be more knowledgeable than some of my other teachers.	SA	A	U	D	SD
Science teachers seem to present the material more interestingly than other teachers.	SA	A	U	D	SD
Science teachers have better discipline than other teachers.	SA	A	U	D	SD
Science teachers invite me to feel more welcome than other teachers.	SA	A	U	D	SD
Science teachers encourage only males to take science.	SA	A	U	D	SD
Science teachers seem to care more about me than other teachers.	SA	A	U	D	SD
I like science.	SA	A	U	D	SD

4. Do you have a reason for taking science not listed in the rating statements? If so, please tell us.

5. What are some of the things which you believe should be changed in the science classes at Cocoa High School?

6. What are some of the things in the Cocoa High School science classes which you believe are important to students?

7. If there is anything else which you can say about Cocoa High science classes, please do.

Analysis of the REsponses

The instrument was given to all students present in their science classes on may 12, 1981. 836 papers were retuened to me. We had on our rolls 1 024 students in science classes. For those students who were taking more than one science class, only one paper was completed.

Ninth Grade

A total of 249 ninth graders responded; 121 males and 128 females. Ninety-three per cent of the males were in their first CHS science course, while seven per cent of these were taking two courses. Ninety-seven per cent of the females were in their first CHS science course, while three per cent were taking two science courses.

Ninety-two per cent of the males planned to take more courses in science, while ninety-six per cent of the females were of the same mind. What was noteworthy was that between the males and the females, the percentages planning to take two, three, four, or more classes in science was about the same.

In the reaction sections for this group, one may see that the responses did not show variation by sex. These were so similar that there seemed to be no reason for separating these by gender in this analysis.

Other-Directed Reasons for Taking Science

Approximately, fifty per cent of both sexes admitted to knowing that their parents wanted them to take science. This, then appears to be the reason for about one half of these students' taking science.

That twenty-four per cent of the males and sixteen per cent of the females were influenced by a counselor to take science, along with twelve and nine per cent who were undecided gives reason to believe tha

about thirty per cent of these ninth graders needed some guidance in course choices, or at least admitted to accepting guidance.

Approximately, twenty per cent of the ninth graders saw science as the only choice as an elective.

This section appears to indicate that some fifty per cent of the ninth graders may be directly influenced by their parents, while counselors may exert influence on about twenty-five per cent.

Understanding the Role of Science Education

The response to the first item in this section gives an overall view of approximately seventy per cent of these students indicating that they understand that science is a part of their total education and is something that they want. The females responded to the second item higher than the males by about eleven per cent. Eighty-five per cent of the females and seventy-four per cent of the males admitted to knowing that they need to know those things which can be learned in science. The reasons for the difference may be many and varied.

The last item in this section may have been subject to definition. The item was put in to assess student understanding of science's effect on society. Thirty-nine per cent of the females and thirty-three per cent of the males take science for this reason; yet thirty-one and thirty-five per cent are undecided on this item, with about thirty per cent of both groups disagreeing.

The message to science teachers may be that more needs to be done to connect science with its societal effects.

To the credit of the students, more than seventy per cent were aware that science is a part of their total education.

Career Aspirations

Five per cent of the females and eight per cent of the males admitted to wanting to be scientists; however, they define this. There was a plastic group here of about twenty per cent who were undecided. This item was noteworthy in that forty-six per cent of the females and forty-four per cent of the males marked strongly disagree. Overall disagreement outweighed the choice by far.

The response to the second item may reflect the immaturity of this group, in that they have not yet made a decision about a career. Thirty-five per cent of the females and twenty-one per cent of the males saw a science background as supportive of a career; also, the undecided was on the order of about thirty-three per cent for both groups.

The last item in this section showed the females at sixty-six per cent and the males at fifty-five per cent in their equating science as an aid for college. The undecided may reflect an indecision about college, or the effect of science; sixteen per cent of the females and twenty-four per cent of the males were undecided.

This section seemed to show that among the ninth graders, the undecided group was the one which requires more information. The implications for science teachers seem to be (1) be definite about the role of science in any educational pursuit, at least beyond high school; (2) encourage those who might want to be scientists; and (3) integrate into the classes career inforamtion.

Effects of Science Classroom Atmosphere

Sixty-eight per cent of the females and sixty per cent of the males liked science. Seventeen per cent of this total group was undecided. The ninth graders gave a loud call for "hands-on" activities, when seventy-

one per cent of the females and seventy-nine per cent of the males said that they like to work with their hands. This is plainly clear.

Twenty-two per cent of the total group strongly liked the teacher while about forty per cent liked the teacher. What about the other thirty-eight per cent?

The feeling of success in the science class for ninth graders needs study and probably some kind of action. (Another goal for the department chairman. This kind of thing has got to stop somewhere!) Thirty-seven per cent of the ninth graders felt successful in the science class and thirty per cent felt unsuccessful with the remainder not being able to decide. This one may not be too difficult to decipher.

The CHS science teachers did not appear sexest to the ninth grade students. About eighty-two per cent of these students did not see the teachers encouraging only males to take science. Thirty-six per cent of the ninth graders as a group said that their teachers expect them to work too hard, while about forty-three per cent did not agree. There seemed to be a balance, yet I do not know exactly how to interpret this.

This section seems to indicate that more than half of the students like science, and the science teacher; two things which should keep these students taking science. The problem of a feeling of success must be resolved. The single most important part of this section is that students do like "hands-on" science activities.

Comparison of Science Teachers' Mehtods with Other Teachers'

This total section for ninth graders shows that science teachers' methods are not necessarily reasons for students to take science. Forty-eight per cent of the group saw the science teachers as more knowledgeable, while about half of the ninth graders viewed the science teachers as pre-

senting the materials more interestingly.

I cannot view this section as giving any edge to the science teachers as being reasons for students to take science, at least those in the ninth grade. It is fortunate that the students have other reasons for taking science because that is a large burden to place on the shoulders of the teachers of the ninth grade. The entire program could be killed by the response these students give to the teacher!

DATA

Female Grade 9 Number of cases 128

Responses in percentages

1. How many CHS science courses have you taken?	1	2					
	97	3					
2. While you are a student in CHS, how many science classes do you plan to take?	1	2	3	4	5	6	7
	4	31	30	30	2	2	
3. RATING	SA	A	U	D	SD		
OTHER-DIRECTED REASONS FOR TAKING SCIENCE							
My parents want me to take science.	13	36	18	20	13		
I needed to fill my schedule and my counselor suggested a science course.	3	13	9	52	23		
I take science because there is nothing else to take as an elective.	3	9	9	41	39		
UNDERSTANDING OF THE ROLE OF SCIENCE EDUCATION							
I want a well-rounded education, this includes science.	28	46	13	10	4		
I need to know the things that I can learn in science classes.	22	63	10	3	2		
I am living in a time when scientific research has reached into most of activities. For this reason, I want to take as much science as I can.	12	27	31	20	9		
CAREER ASPIRATIONS							
I want to be a scientist.	1	4	20	29	46		
My future career requires a science background	18	17	30	17	17		
I want to go to college and I believe that science courses will help me to prepared.	31	35	16	13	5		

EFFECTS OF SCIENCE CLASSROOM ATMOSPHERE	SA	A	U	D	SD
I like science.	22	46	14	8	10
I like to work with my hands and move around during class.	22	49	13	13	2
I like the teacher in the science class.	23	46	12	9	10
I have a feeling of success in my science class.	8	25	37	20	11
Science teachers encourage only males to take science.	2	6	7	39	45
Science teachers expect me to work too hard.	7	26	21	35	10
COMPARISON OF SCIENCE TEACHERS' METHODS WITH OTHER TEACHERS'					
Science teachers seem to be more knowledgeable than some of my ohters.	10	37	26	22	5
Science teachers seem to present the material more interestingly than ...	11	34	28	18	8
Science teachers allow more reasonable freedom than other teachers.	6	16	22	36	20
Science teachers invite me to feel more welcome than other teachers.	2	20	39	26	14
Science teachers seem to care more about me than other teachers.	2	5	38	32	24
Science teachers have better discipline than other teachers.	9	24	37	19	10

DATA

Male Grade 9 Number of cases 121

Responses given in percentages.

1. How many CHS science courses have you taken?	1	2	3	4	5	6	7
	93	7					
2. While you are a student in CHS, how many science classes do you plan to take?	1	2	3	4	5	6	7
	8	29	38	23	2		
3.RATING	SA	A	U	D	SD		
OTHER-DIRECTED REASONS FOR TAKING SCIENCE							
My parents want me to take science.	17	36	28	13	7		
I needed to fill my schedule and my counselor suggested a science course.	4	20	12	44	19		
I take science because there is nothing else to take as an elective.	7	4	13	40	36		
UNDERSTANDING OF THE ROLE OF SCIENCE EDUCATION							
I want a well-rounded education, this includes science.	24	45	23	8			
I need to know the things that I can learn in science classes.	21	53	18	5	2		
I am living in a time when scientific research has reached into most of life's activities. For this reason, I want to take as much science as...	12	21	35	25	7		
CAREER ASPIRATIONS							
I want to be a scientist.	3	5	23	26	44		
My future career requires a science background.	14	9	37	25	15		
I want to go to college and I believe that science courses will help me to be prepared.	20	35	24	14	7		

EFFECTS OF SCIENCE CLASSROOM ATMOSPHERE	SA	A	U	D	SD
I like science.	25	35	19	8	13
I like to work with my hands and move around during class.	29	50	13	5	3
I like the teacher in the science class.	21	37	15	8	20
I have a feeling of success in my science class.	9	32	29	20	10
Science teachers encourage only males to take science.	2	3	17	38	41
Science teachers expect me to work too hard.	18	21	20	31	11
COMPARISON OF SCIENCE TEACHERS' METHODS WITH OTHER TEACHERS'					
Science teachers seem to be more knowledgeable than some of my others.	11	37	29	19	4
Science teachers seem to present the material more interestingly than...	17	39	25	18	2
Science teachers allow more reasonable freedom than other teachers.	7	23	24	22	25
Science teachers invite me to feel more welcome than other teachers.	7	15	42	26	10
Science teachers seem to care more about me than other teachers.	4	12	33	33	18
Science teachers have better discipline than other teachers.	12	21	40	22	4

Tenth Grade

There were 295 tenth graders in this total survey; 161 females and 134 males.

Eighty-one per cent of the females were in their second science course, while seventy-five per cent of the males were in the second course. Sixteen per cent of both males and females were taking science for the first time. The others had taken more than this.

Eight per cent of the females and three per cent of the males plan to stop with one science credit, while fifty per cent of the females and sixty-three per cent of the males plan to take three or more credits in science.

Other-Directed Reasons for Taking Science

The tenth graders did not admit to much influence for taking science, other than parents' wishes. For the females, thirty-seven per cent said that parents wanted them to take science, while forty-four per cent of the males responded similarly. Parents are still important to this group with counselors and the view of the school program less so.

Understanding the Role of Science Education

Both males and females as a group seemed to be aware of their need for science education; over seventy-five per cent of this group responded positively to these two first items, the strength of the agreement was about the same. In the question relating to science-society effects as a reason for taking science, the males responded with fifty-one per cent agreement, while thirty-one per cent of the females gave this as a reason for taking science. The effect of science on society does not seem to be an overriding reason for taking science as compared to an understanding of the need to know those things which can be learned

in the science classes.

Career Aspirations

The tenth graders did not seem taken with the idea of being a scientist. Four per cent of the females and seven per cent of the males said that this was their desire. The ratio of the males to the females in the undecided area is three to one. Perhaps, the males see this as more of a possibility than the females.

In terms of a future career that requires a science background, the responses were somewhat close in each of the reaction areas. Thirty-three per cent of the tenth graders saw science as a need to support a career; about thirty-one per cent still did not know and about thirty-five per cent disagreed with the necessity of science background as a support for a future career.

The last item in this section for both males and females was similar in the weight of the responses in each of the reaction areas. Fifty-eight per cent saw themselves as wanting to go to college and believed that high school science would help them once there were there. The strength of this agreement was about half and half.

Effects of Science Classroom Atmosphere

Males and females in the tenth grade, who were taking science, liked science to the tune of about sixty-nine per cent overall. Yet the strength of the response was not quite the same, the males and females were in a nine to five ratio in strongly agreeing to this item.

The second item in this section appeared to say that, even though there was an eighty-one per cent total agreement regarding hands-on activities, the males were more adamant about this than the females. The ratio of males to females in strongly agreeing was ten to seven.

The tenth grade students liked their science teachers, about eighty-three per cent agreed to this. This item seemed important in that there was approximately a ten to seven ratio of strongly agree to agree in the strength of this agreement. Liking the teacher for tenth graders did not equate to a feeling of success in the science classroom. Short of fifty per cent admitted to a feeling of success. Overall about thirty per cent of the tenth graders saw their theachers as expecting too much work, while fifty-three per cent were not of this opinion. As with the ninth grade students, these students saw their science teachers, by and large, as non-sexest in their encouragement of students in the taking of science courses.

From this section , I am concerned that less than half of these students did not have a feeling of success, when they said that they were not expected to work too hard. These students may equate an A grade with success. Students liked lab activities and their teachers. What better beginning can a science teacher have?

Comparison of Science TEachers' Methods with Other Teachers'

The first two items which dealt with knowledge and presentation of material, the science teachers were viewed on the positive side of the comparison with other teachers by about sixty per cent of these students.

About forty-eight per cent of the students saw their science teachers allowing more reasonable freedom than others. Forty per cent of these students admitted to being invited to feel more welcome by science teachers. However, one may conclude that being more welcome is not equal to being cared about, because only twenty-three per cent sensed more caring as opposed to forty per cent disagreement. I believe that most teachers care for students and that this quality is not unique to science

teachers. Only twenty-seven per cent said that science teachers had better discipline, while on the whole, twenty-eight per cent disagreed. this comparison section showed more undecidedness than any of the other sections. The reason for this may have been subject to the definition of discipline in the minds of the individuals.

Any attempt to deduce reasons for taking science by the tenth graders based on comparisons with other teachers must be done with great caution. There is not enough evidence here for me to make a clear-cut statement.

DATA

Male Grade 10 Number of cases 134

Responses in percentages

	1	2	3	4	5	6	7
1. How many CHS science courses have you taken?	16	75	8	1			
2. While you are a student in CHS, how many science classes do you plan to take?	3	34	33	24	6		

3.RATING	SA	A	U	D	SD
OTHER-DIRECTED REASONS FOR TAKING SCIENCE					
My parents want me to take science.	10	34	21	21	14
I needed to fill my schedule and my counselor suggested a science class.	6	10	7	46	31
I take science because there is nothing else to take as an elective.	1	4	7	46	42
UNDERSTANDING OF THE ROLE OF SCIENCE EDUCATION					
I want a well-rounded education, this includes science.	26	51	15	8	0
I need to know the things that I can learn in science classes.	28	56	13	1	2
I am living in a time when scientific research has reached into most of life's activities. For this reason, I want to take as much science as I can .	18	33	30	14	5
CAREER ASPIRATIONS					
I want to be a scientist.	4	3	32	24	37
My future career requires a science background.	22	16	31	21	10
I want to go to college and I believe that science courses will help ...	29	31	26	11	3

EFFECTS OF SCIENCE CLASSROOM ATMOSPHERE	SA	A	U	D	SD
I like science.	36	37	15	4	8
I like to work with my hands and move around during class.	40	45	10	4	1
I like the teacher in the science class.	46	37	10	1	6
I have a feeling of success in the science class.	21	37	25	12	6
Science teachers encourage only males to take science.	2	3	12	24	59
Science teachers expect me to work too hard.	11	20	17	39	14
COMPARISONS OF SCIENCE TEACHERS' METHODS WITH OTHER TEACHERS'					
Science teachers seem to be more knowledgeable than some of my other teachers.	23	43	16	16	3
Science teachers seem to present the material more interestingly than other teachers.	29	37	21	11	2
Science teachers allow more reasonable freedom than other teachers.	20	34	25	12	10
Science teachers invite me to feel more welcome than other teachers.	16	34	21	17	11
Science teachers seem to care more about me than other teachers.	11	16	34	29	10
Science teachers have better discipline than other teachers.	10	20	46	16	7

DATA

Female Grade 10 Number of cases 161

Responses given in percentages

1. How many CHS science courses have you taken?	1	2	3	4	5	6	7
	16	81	5				
2. While you are a student in CHS, how many science classes do you plan to take?	1	2	3	4	5	6	7
	8	42	25	22	3		

3. RATING	SA	A	U	D	SD
OTHER-DIRECTED REASONS FOR TAKING SCIENCE					
My parents want me to take science.	11	26	22	26	15
I needed to fill my schedule and my counselor suggested a science class.	6	13	12	36	34
I take science because there is nothing else to take as an elective.	1	5	5	47	42
UNDERSTANDING OF THE ROLE OF SCIENCE EDUCATION					
I want a well-rounded education, this includes science.	29	47	12	11	1
I need to know the things that I can learn in science classes.	22	58	13	7	1
I am living in a time when scientific research has reached into most of life's activities. For this reason, I want to take as much science as I can.	11	20	35	28	6
CAREER ASPIRATIONS					
I want to be a scientist.	1	3	10	33	53
My future career requires a science background.	17	13	31	22	17
I want to go to college and I believe that science classes will help me...	31	25	25	15	3

EFFECTS OF SCIENCE CLASSROOM ATMOSPHERE	SA	A	U	D	SD
I like science.	20	44	16	11	10
I like to work with my hands and move around during class.	28	49	10	10	3
I like the teacher in the science class.	52	30	9	4	4
I have a feeling of success in my science class.	6	33	31	21	9
Science teachers encourage only to take science.	0	1	10	25	64
Science teachers expect me to work too hard.	8	22	17	41	12
COMPARISON OF SCIENCE TEACHERS' METHODS WITH OTHER TEACHERS'					
Science teachers seem to be more knowledgeable than some of my....	20	34	23	18	6
Science teachers seem to present the material more interestingly than some of my other teachers.	17	39	25	14	6
Science teachers allow more reasonable freedom than other teachers.	11	30	26	16	17
Science teachers invite me to feel more welcome than other teachers.	9	23	28	30	10
Science teachers seem to care more about me than other teachers.	4	15	34	30	17
Science teachers have better discipline than other teachers.	8	16	43	27	6

Eleventh Grade

174 eleventh grade students responded to this survey; 98 males, and 76 females. At this point in their education, seventy-seven per cent of the males and sixty-one per cent of the females had taken three or more science courses. Sixty per cent of the males and forty-five per cent of the females said that they planned to take four or more science courses in high school.

Other-Directed Reasons for Taking Science

In this section there does not seem to be much difference in the general responses of males and females. For this reason, the discussion will not center on gender, but on the total group responses.

Parents may have affected the choices of approximately fifty per cent of the juniors. However, the ratio of the strength of this agreement was one to four, strongly agree to agree. Only about a quarter of the juniors admitted to counselor's influence, and then only to fill a schedule. The choice of science by juniors did not seem to be by default, eighty-eight per cent implied that there were other courses to take. Therefore, I conclude that science was chosen mainly for the reasons given in the following sections.

Understanding the Role of Science Education

Overall, eighty-six per cent of the juniors were taking science because of its part in education and there was an overall ratio of three to five strongly agree to agree in this reaction continuum. The need to know "science things" claimed eighty-eight per cent positive responses from juniors; again about the same ratio of response strenth as before.

Only fifty-four per cent of jnuiors saw the effects of science on society as a reason for taking science. Here the strength of the

total response was about one to two; strongly agree to agree.

These juniors have apparently gotten the message about the role of science in education; therefore, I have concluded that this is one of the reasons for their taking science courses.

Career Aspirations

In this section, the responses were so similar between the sexes that there seemed, again, no cogent reason to examine the responses from the vantage of the respondents' genders.

About eight per cent of the juniors claimed a desire to become scientists, with another thirty-three per cent who were poised in either direction. Forty-nine per cent appeared to have chosen a career which will require science as a background and here the strength of the reaction is close to one to one, strongly agree to agree. Also, there sat a group of twenty-seven per cent in the undecided column. These people are the ones who needed to know about the possibilities which await them, or perhaps, they knew and were truly undecided. Seventy-six per cent of juniors saw science courses as an aid for college preparation. Their response strength for this reaction was four to three, strongly agree to agree.

Effects of Science Classroom Atmosphere

CHS jnuiors liked science, seventy-nine per cent said so. This appeared to be one place where there was a variation according to the sex of the respondents. The females agreed to liking science in a ratio of two to five, strongly agree to agree, while the males responded one to one, strongly agree to agree. Eighty-one per cent said that they liked "hands-on" activities with a reaction strength in the ratio of three to five, strongly agree to agree. The teachers of the juniors who were taking science were liked to the tune of eighty-eight per cent, with a response

reaction strength of one to one strongly agree to agree.

Although fifty-four per cent admitted to a feeling of a degree of success, the reaction is one to four strongly agree to agree, while about thirty per cent were undecided. This thirty per cent is the group I most want to move. None of the junior girls saw the science teachers encouraging males more than females to take science. On the other hand, about five per cent of the males agreed to this and fourteen per cent was in the undecided column. I suggest that these few were either not serious, or perhaps, too self-centered to observe anything going on outside of themselves. The females, who probably would be the most sensitive in this area, responded to this item with disagreement in a reaction ratio of four to seven, disagree to strongly disagree.

The juniors did not see themselves as being expected to work too hard, because sixty per cent of them responded this way; their reaction strength was in a ratio of five to one disagree to strongly disagree. This response means to me that there is some tension in expectations, but not out of reason.

Comparison of Science Teachers' Methods with Other Teachers'

This total picture which was presented by the responses which compared science teachers with other teachers appeared to be fraught with complications. The indecision in reactions appeared to be too high to allow for any sound conclusions to be made.

In the first two items, I conclude that over fifty per cent of the juniors viewed science teachers as being more knowledgeable and interesting in presentation of materials, notwithstanding that thirty per cent claimed indecision. This may be a tentative reason for their taking science, but I am not willing to go for this without reservation.

Science teachers do, according to about forty-nine per cent, allow more freedom and about fifty per cent said that they were invited to feel more welcome in science classerooms. In the item relating to caring, science teachers did not show any more caring than other teachers. The same kind of response was given for discipline in the science classrooms as that given for teacher caring.

My gut reaction is that these juniors are taught by many caring teachers whose discipline may be about the same, whatever it is. Not only this, but also, there may be an inherent dislike for comparing in the forced choice kind of way which this reaction sheet demanded.

Juniors appeared to take science because about half of them respond to parental wishes. They understand the role of science courses in their education and its effect on their future activities. Not only do they like science and its activities, but they also like their teachers. These seem to be reasonable conclusions which may be drawn from this group's responses.

DATA

Female grade 11 Number of cases 76

Responses given in percentages

1. How many CHS science courses have you taken?	1	2	3	4	5	6	7	8	
	4	36	52	5	3		1		
2. While you are a student in CHS, how many science classes do you plan to take?	1	2	3	4	5	6	7	8	10
	4	15	35	36	3	4	1		1
3. RATING	SA		A		U		D		SD

OTHER-DIRECTED REASONS FOR TAKING SCIENCE

My parents want me to take science.	10	38	17	20	15
I needed to fill my schedule and my counselor suggested a science class.	3	21	11	39	26
I take science because there is nothing else to take as an elective.	3	5	3	45	45

UNDERSTANDING OF THE ROLE OF SCIENCE EDUCATION

I want a well-rounded education, this includes science.	34	54	9	3	0
I need to know the things that I can learn in science classes.	37	51	8	3	1
I am living in a time when scientific research has reached into most of life's activities. For this reason, I want to take as much science as I can.	16	31	35	17	1

CAREER ASPIRATIONS

I want to be a scientist.	4	3	23	26	45
My future career requires a science background.	24	22	25	21	8
I want to go to college and I believe that science courses will help me to be prepared.	41	32	17	8	3

EFFECTS OF SCIENCE CLASSROOM ATMOSPHERE	SA	A	U	D	SD
I like science.	24	54	13	5	4
I like to work with my hands and move around during class.	29	51	11	5	4
I like the teacher in the science class.	47	44	5	3	1
I have a feeling of success in my science class.	12	39	32	13	4
Science teachers encourage only males to take science.	0	0	0	35	65
Science teachers expect me to work too hard.	5	16	11	58	11
COMPARISON OF SCIENCE TEACHERS' METHODS WITH OTHER TEACHERS'					
Science teachers seem to be more knowledgeable than some of my other teachers.	20	29	30	16	5
Science teachers seem to present the material more interestingly than other teachers.	15	36	27	17	5
Science teachers allow more reasonable freedom than other teachers.	11	33	25	21	11
Science teachers invite me to feel more welcome than other teachers.	20	24	36	17	4
Science teachers seem to care more about me than other teachers.	14	18	32	25	11
Science teachers have better discipline than other teachers.	7	14	49	28	3

DATA

Male Grade 11 Number of cases 98

Responses given in percentages

1. How many CHS science courses you taken?	1	2	3	4	5	6	7	8
	8	15	65	12				
2. While you are a student in CHS, how many science courses do you plan to take?	1	2	3	4	5	6	7	8
	3	9	27	49	10	1		

3. RATING	SA	A	U	D	SD
OTHER-DIRECTED REASONS FOR TAKING SCIENCE					
My parents want me to take science.	13	44	18	17	7
I needed to fill my schedule and my counselor suggested a science class.	5	19	10	40	26
I take science because there is nothing else to take as an elective.	3	9	2	45	41
UNDERSTANDING OF THE ROLE OF SCIENCE EDUCATION					
I want a well-rounded education, this includes science.	32	52	8	7	1
I need to know the things that I can learn in science classes.	32	56	8	2	1
I am living in a time when scientific research has reached into most of life's activiites. For this reason, I want to take as much science as I can.	19	42	27	11	1
CAREER ASPIRATIONS					
I want to be a scientist.	5	3	42	27	22
My future career requires a science background.	28	24	29	13	6
I want to go to college and I believe that science courses will help me to be prepared.	45	33	16	5	1

EFFECTS OF SCIENCE CLASSROOM ATMOSPHERE	SA	A	U	D	SD
I like science.	37	42	13	5	3
I like to work with my hands and move around during class.	34	48	10	6	2
I like the teacher in the science class.	41	44	10	3	1
I have a feeling of success in my science class.	14	43	27	10	6
Science teachers encourage only males to take science.	1	4	14	42	38
Science teachers expect me to work too hard.	12	14	23	39	13
COMPARISON OF SCIENCE TEACHERS' METHODS WITH OTHER TEACHERS'					
Science teachers seem to be more knowledgeable than some of my other teachers.	15	41	31	11	2
Science teachers seem to present the material more interestingly than other teachers.	20	39	30	9	2
Science teachers allow more reasonable freedom than other teachers.	17	36	22	18	6
Science teachers invite me to feel more welcome than other teachers.	16	39	28	11	5
Science teachers seem to care more about me than other teachers.	7	18	46	19	10
Science teachers have better discipline than other teachers.	4	30	48	13	5

Twelfth Grade

There were 72 responses from the seniors, 19 females and 53 males. This number represented about twenty per cent of those seniors who were graduated this year.

Only six per cent of these seniors had taken the minimum science requirement for graduation and these were male. Fifteen per cent of the males had two science credits. Thirty-two per cent of the females and twenty-five per cent of the males had three science credits, while forty-two per cent of both sexes had four credits in science. Twenty-six per cent of the females and eight per cent of the males had taken five science classes. Two per cent of the males had six, while four per cent had eight credits in science.

From this I conclude that the one credit science requirement for graduation has not affected this group, but only this group. There were 355 names on the graduation list so very little may be concluded about the effect of one credit requirement in science on the class as a whole. To extrapolate from this select group would not serve any honest report.

The males and females responded with sufficient variation to cause the reactions to be examined comparatively.

Other-Directed Reasons for Taking Science

Fifty-eight per cent of the females and fifty per cent of the males admitted that their parents wished for them to take science; however, the strength of this group's response is interesting. The females had a reaction of about one to one strongly agree to agree, while the males reacted one to five strongly agree to agree. The males responded more to counselors' suggestions than did the females, thirty-one per cent to eleven per cent.

These seniors seemed to have taken science mainly for reasons of their own, although there may still be some individuals who show vulnerability to suggestion from parents, or sometimes counselors.

Understanding the Role of Science Education

One hundred per cent of the females included science in a well-rounded education, while only eighty-three per cent of the males were definite on this subject. The females seemed to be more adamant in knowing what they need than the males. Eighty-nine per cent of the females and ninety-one per cent of the males admitted that they need "science things," yet the response ratios are different: about two to one strongly agreed to agreed for the females and four to five strongly agreed to agreed for the males.

Both sexes were similar in their response to the science-society item. Seventy-four per cent of both groups recognized this item as a reason for taking science.

The seniors who responded to this survey appeared to have been taking science because they saw it as a part of their total education.

Career Aspirations

About ten per cent of the seniors wanted to be scientists when they responded to this survey. There was a total of sixty-eight per cent of the females who saw science as important to their careers and sixty per cent of the males. Ninety-four per cent of the females who completed this survey indicated a desire to go to college and believed that science would help them, while only seventy-eight per cent of the males were in this category.

From this I conclude that the seniors in this survey appeared to see science as having future benefit for them.

Effects of Science Classroom Atmosphere

Eighty-nine and ninety-five per cent of the females and males claimed that they like science. The six per cent of the males who disagreed may have been the six per cent who had only one credit in science, who knows?

There is no doubt at this point, that "hands-on" activities represent a potent reason for taking science. Ninety-five per cent of the females and eighty-seven per cent of the males agreed to this. The seniors in this sample liked their teachers; one hundred per cent for the females and eighty-six per cent for the males. The reaction ratio here was strong: about three to one strongly agree to agree for both groups. The teacher may be one of the reasons for their remaining in science?

AT last! Seventy-nine per cent of the females and seventy-one per cent of the males said that they had a feeling of success in science! Little or no, sexism among science teachers was the report of these seniors. Furthermore, they indicated that they did not feel overworked. (I wonder why the seniors were always growling at me for this or that heavy assignment?)

Comparison of Science Teachers' Methods with Other Teachers'

There does not seem to be a good reason for separating the responses of the sexes in this section. For both groups, the undecided column is higher than in the other sections for the seniors. The reason for this may be that seniors are more able than other groups to exercise autonomy in the selection of their teachers in all of their courses?

With the seniors, the science teachers' knowledge and methods were viewed a little higher than other teachers', but not enough for me to mark this item as a conclusive reason for students to take science.

In this section, the last four items were somewhat equivocal, too much indecision.

My thoughts about the other teachers and their methods is that most of us are similar in our reponses to teaching and students. Also, I am aware that these seniors are being taught by some teachers who are outstanding in their dedication to the philosophy of quality education for all and comparisons had best be left alone.

DATA

Male Grade 12 — Number of cases 53

Responses given in percentages

1. How many CHS science courses have you taken?	1	2	3	4	5	6	7	8
	6	15	25	42	8	2		4
2. While you are a student in CHS, how many science courses do you plan to take?	Not applicable to seniors							

3. RATING	SA	A	U	D	SD
OTHER-DIRECTED REASONS FOR TAKING SCIENCE					
My parents want me to take science courses.	8	42	28	17	6
I needed to fill my schedule and my counselor suggested a science class.	8	23	8	30	32
I take science because there is nothing else to take as an elective.	0	6	4	40	50
UNDERSTANDING THE ROLE OF SCIENCE EDUCATION					
I want a well-rounded education, this includes science.	45	38	11	6	0
I need to know the things that I can learn in science classes.	38	53	8	2	0
I am living in a time when scientific research has reached into most of life's activities. For this reason, I want to take as much science as I can.	36	38	11	15	0
CAREER ASPIRATIONS					
I want to be a scientist.	8	2	28	40	23
My future career requires a science background.	26	34	7	19	4
I want to go to college and I believe that science courses will help me to be prepared.	42	36	11	8	4

EFFECTS OF SCIENCE CLASSROOM ATMOSPHERE	SA	A	U	D	SD
I like science.	55	40	0	4	2
I like to work with my hands and move around during class.	38	49	11	0	2
I like the teacher in the science class.	60	26	11	0	2
I have a feeling of success in my science class.	23	49	13	6	6
Science teachers encourage only males to take science.	0	0	8	40	53
Science teachers expect me to work too hard.	6	8	15	51	21
COMPARISON OF SCIENCE TEACHERS' METHODS WITH OTHER TEACHERS'					
Science teachers seem to be more knowledgeable than some of my other teachers.	30	30	26	11	2
Science teachers eem to present the material more interestingly than other teachers.	23	45	19	13	0
Science teachers allow more reasonable freedom than other teachers.	11	36	23	21	9
Science teachers invite me to feel more welcome than other teachers.	15	36	36	9	4
Science teachers seem to care more about me than other teachers.	8	23	36	25	9
Science teachers have better discipline than other teachers.	8	17	55	17	4

DATA

Female Grade 12 — Number of cases 19

Responses given in percentages

1. How many CHS science courses have you taken?	1	2	3	4	5	6	7	8
			32	42	26			
2. While you are a student in CHS, how many science classes do you plan to take?	Not applicable to seniors							
3. RATING	SA		A		U		D	SD
OTHER-DIRECTED REASONS FOR TAKING SCIENCE								
My parents want me to take science courses.	26		32		16		16	11
I needed to fill my schedule and my counselor suggested a science class.	0		11		5		42	42
I take science because there is no-else to take as an elective.	0		5		11		21	63
UNDERSTANDING THE ROLE OF SCIENCE EDUCATION								
I want a well-rounded education, this includes science.	53		47		0		0	0
I need to know the things that I can learn in science classes.	63		26		5		5	0
I am living in a time when scientific research has reached into most of life's activities. For this reason, I want to take as much science as I can.	32		42		16		11	0
CAREER ASPIRATIONS								
I want to be a scientist.	11		0		16		47	26
My future career requires a science background.	47		21		16		16	0
I want to go to college and I believe that science courses will help me to be prepared.	68		26		5		0	0

EFFECTS OF SCIENCE CLASSROOM ATMOSPHERE	SA	A	U	D	SD
I like science.	47	42	5	5	0
I like to work with my hands and move around during class.	32	63	5	0	0
I like the teacher in the science class.	74	26	0	0	0
I have a feeling of success in my science class.	32	47	16	5	0
Science teachers encourage only males to take science.	0	0	0	47	53
Science teachers expect me to work too hard.	0	0	11	63	26
COMPARISON OF SCIENCE TEACHERS' METHODS WITH OTHER TEACHERS'					
Science teachers seem to be more knowledgeable than some of my other teachers.	28	28	28	17	0
Science teachers seem to present the material more interestingly than other teachers.	37	26	11	26	0
Science teachers allow more reasonable freedom than other teachers.	16	21	21	32	11
Science teachers invite me to feel more welcome than other teachers.	32	26	21	21	0
Science teachers have better discipline than other teachers.	0	11	53	37	0
Science teachers seem to care more about me than other teachers.	21	21	26	32	0

SUMMARY

After the pain of counting all of these responses and analyzing this data, I hear some saying, "So what?" or "Who cares what Cocoa High School students think about science and reasons for taking science?" For one, "I care!"

CHS students seemed to have been taking science for the following reasons:

1. About half of them were being influenced by their parents.
2. Most of them understood the role of science education in their total education.
3. Many saw science backgrounds as helpful to them for future reasons, college and/or career preparation.
4. Most of the students liked science for itself alone.
5. Most of the students liked hands-on activities.
6. Most of the students saw both sexes as being encouraged to take science courses by their science teachers.
7. Few students said that they were expected to work too hard by their science teachers.
8. About half or more the the students viewed science teachers as knowledgeable, interesting in presentation of the subject, and welcoming of them.

CHS students did not seem to be taking science for the following reasons:

1. Other-directed reasons, e.g., counselors, or lack in the school program for other courses in which to spend time.
2. The effect of science on society.

3. Their desire to become scientists.

4. Comparing science teachers to other teachers of other courses.

This information can be used to put new life into the science curriculum at Cocos High School. We shall need to explore those reasons for students' failure to feel successful in the early years of taking science; this may be the key which unlocks the riddle for less than half of the seniors in a science course.

The open-ended questions did not produce information different from that which was gained from the reaction items. There were groups which said they would like to have more time in the laboratory. This may mean that some teacher were not exploiting this instructional strategy to the best advantage. From all of the groups there were variable responses relating to teachers, they either praised us or damned us in these open-ended questions. From an objective point of view, these open-ended questions did not yield the kind of data which could be put to best use.